

**WHAT IS CLAIMED IS:**

1. A hydrogen supply system for a fuel cell, comprising:
  - a hydrogen storage unit configured to store hydrogen;
  - a hydride storage unit configured to store aqueous hydride;
- 5 a reactor coupled to the reactor and the hydrogen storage unit and configured to be supplied with aqueous hydride from the hydride storage unit, the reactor configured to react the supplied aqueous hydride to generate oxide and hydrogen;
- 10 a heat exchanger coupled to the reactor and configured to be supplied with hydrogen from the reactor to transfer heat contained in the supplied hydrogen to a coolant circulating through a fuel cell stack;
- a regenerator also coupled to the reactor and configured to be supplied with oxide from the reactor and hydrogen from the hydrogen storage unit, where the regenerator is configured to react the supplied oxide and hydrogen, thereby generating an aqueous hydride;
- 15 a first valve disposed inline between the hydrogen storage unit and the fuel cell stack and configured to control a supply of hydrogen from the hydrogen storage unit to the fuel cell stack;
- a second valve disposed inline between the hydrogen storage unit and the regenerator and configured to control a supply of hydrogen from the hydrogen storage unit to the regenerator;
- 20 a third valve disposed inline between the heat exchanger and the fuel cell stack and configured to control a supply of hydrogen from the heat exchanger to the fuel cell stack;
- a temperature detector configured to detect a temperature of coolant flowing to the fuel cell stack and to generate a corresponding temperature signal; and

a control unit configured to generate control signals for actuating the first valve, the second valve, and the third valve based on the temperature signal from the temperature detector.

5 2. The hydrogen supply system for a fuel cell according to claim 1, wherein the aqueous hydride is one of aqueous sodium borohydride ( $\text{NaBH}_4$ ), aqueous lithium borohydride ( $\text{LiBH}_4$ ), and aqueous sodium hydride ( $\text{NaH}$ ).

10 3. The hydrogen supply system for a fuel cell according to claim 1, wherein if the temperature of the coolant is higher than a predetermined temperature, the control unit opens the first valve and closes the second valve and the third valve.

15 4. The hydrogen supply system for a fuel cell according to claim 1, wherein if the temperature of the coolant is not higher than a predetermined temperature, the control unit closes the first valve and opens the second valve and the third valve.

5. A hydrogen supply system for a fuel cell, comprising:  
a hydrogen storage unit;  
a hydride storage unit;  
20 a reactor coupled to said hydride storage unit and configured to generate oxide and hydrogen from hydride;  
a heat exchanger coupled to the reactor and configured to transfer heat contained in hydrogen supplied from the reactor to a coolant circulating through a fuel cell stack;  
25 a regenerator coupled to the reactor and the hydrogen storage unit and configured to be supplied with oxide from the reactor and hydrogen from the hydrogen

storage unit, where the regenerator is configured to react the supplied oxide and hydrogen, thereby generating a hydride;

a first valve disposed inline between the hydrogen storage unit and the fuel cell stack and configured to control a supply of hydrogen from the hydrogen storage unit to  
5 the fuel cell stack;

a second valve disposed inline between the hydrogen storage unit and the regenerator and configured to control a supply of hydrogen from the hydrogen storage unit to the regenerator;

a third valve disposed inline between the heat exchanger and the fuel cell stack  
10 and configured to control a supply of hydrogen from the heat exchanger to the fuel cell stack;

a temperature detector configured to detect a temperature of the coolant flowing to the fuel cell stack and to generate a corresponding temperature signal; and

a control unit configured to generate control signals for actuating the first valve,  
15 the second valve, and the third valve based on the temperature signal from the temperature detector.

6. The hydrogen supply system of claim 5, wherein the hydride is selected from a group consisting of: aqueous sodium borohydride ( $\text{NaBH}_4$ ), aqueous lithium  
20 borohydride ( $\text{LiBH}_4$ ), and aqueous sodium hydride ( $\text{NaH}$ ).

7. The hydrogen supply system of claim 5, wherein if the temperature of the coolant is higher than a predetermined temperature, the control unit opens the first valve and closes the second valve and the third valve.

8. The hydrogen supply system of claim 5, wherein if the temperature of the coolant is not higher than a predetermined temperature, the control unit closes the first valve and opens the second valve and the third valve.

5 9. A method for cooling a hydrogen fuel cell comprising:  
calculating the temperature of a coolant flowing to a fuel cell stack;  
determining that said temperature of said coolant is higher than a predetermined  
temperature;  
generating hydrogen at an elevated and oxide from an aqueous hydride;  
10 exchanging heat contained in said hydrogen with said coolant to raise the  
temperature of said fuel cell stack.

10. The method of claim 9, wherein said generating comprises opening a first valve  
between disposed inline between a hydrogen storage unit and said fuel cell stack,  
15 closing a second valve disposed inline between said hydrogen storage unit and a  
regenerator, and closing a third valve disposed inline between a heat exchanger and said  
fuel cell stack.

11. The method of claim 9, further comprising, before said calculating:  
20 storing hydrogen in a hydrogen storage unit; and  
storing an aqueous hydride in a hydride storage unit.

12. The method of claim 11, wherein said generating comprises obtaining said  
aqueous hydride from said hydride storage unit.

13. The method of claim 9, further comprising  
recalculating the temperature of said coolant;  
determining that said temperature of said coolant is below said predetermined  
temperature; and  
5 regenerating aqueous hydride from said oxide and from hydrogen.

14. The method of claim 13, wherein said regenerating comprises closing a first  
valve between disposed inline between a hydrogen storage unit and said fuel cell stack,  
opening a second valve disposed inline between said hydrogen storage unit and a  
10 regenerator, and opening a third valve disposed inline between a heat exchanger and  
said fuel cell stack.

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